



subjects

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SOMATIC, FUNCTIONAL AND MOTOR DIMENSIONS OF NORMAL WEIGHT AND OVERWEIGHT STUDENTS FROM A.S.E. BUCHAREST

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Abstract

Aim. The aim is to identify the differences between the somatic, functional and motor indicators of some young normal weight and overweight women.

Objectives. This paper is part of a wider research with thematic related to physical exercise and life quality. The main objective of this study is to dimension, based on the obtained results, physical exercise programmes in accordance with the characteristics of the subjects.

Methods of research. We used: the bibliographic study, the observation, the experiment to find out, the test, the questionnaire, the statistics methods. The sample is built up of two groups of subjects, each including 30 students of 18 – 24 years old, studying at A.S.E. Bucharest. The participants were initially tested at the beginning of the academic year. To determine the somatic dimension, the following parameters were measured: height, weight, body mass index, body fat percentage, muscular tissue percentage. To determine the functional dimension, Ruffier Test was carried out and the vital capacity was measured. To determine the motor dimension, strength trials were performed aiming the great muscular and strip testing was used for determining the flexibility.

Results. The results enabled, the identification of some significant statistic differences between the normal weight students and the overweight students with regard to somatic dimensions. Concerning the functional and motor dimensions investigated by us, no significant statistic difference were found, all the students proving an initial low level of the strength and flexibility. Some aspects relating to the physical activism of these students, during their leisure time, resulted from the questionnaire they answered to. For obtaining an as complete as possible overview on the characteristics of the two groups of subjects, statistic correlations between the somatic, functional and motor dimensions have been carried out.

Discussions. An objective diagnosis of the development level of subjects was obtained, enabling a proper selection of the contents of the physical education classes, the selection of the most adequate means and the setup of the effort

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parameters, aspects which will be concretized in the design of distinct exercise programmes for normal weight students, respectively for overweight young ladies.

Conclusions. The mandatory sport and physical education class remains the organizational physical exercise form with highest effects on shaping the individual's habit to practice motor activities during the leisure-time, its content ensuring the premises for an active life style from somatic, functional and motor standpoint.

Key-words: normal weight, overweight, somatic, functional, motor, students.

Introduction

A major issue many countries currently faced with is in connection to the overweight and obesity to individuals, exposed due to such causes to severe health affections. Statistics brought to our attention the alarming percentages relating to different categories of population suffering of obesity (30% in USA, 24% in United Kingdom, 23% in Ireland, more than 22% in Malta, 20% in Luxemburg, 12% in Germany). In Romania, this phenomenon gains weight in the last years, mostly at infant level, our country being the third in Europe with an overweight and obese population. To those alarming aspects, data on the inactive lifestyle of individuals add. W.H.O. specifies that 60-85% of the adult population is physically inactive. Bota (2006) shows objective study data of the Romanian Federation „Sport for All” by which she emphasizes the poor representation of sport leisure phenomenon in the people conscience at national level, as well as the poor practice of physical exercise by them.

The deficient nutrition habits and the absence of the physical exercise in the daily activities of an individual represent two of the factors adversely affecting the individual's health condition and, implicitly, leading to the decrease of the life quality. Among the population categories falling under the attention of the researchers with this regard, are students, too, most of them being of youthful age. We hereby remind Lartey, Mishra, Odonwodo et al. (2009), who spotlight the interest of students in the American campuses for a healthy life style as result of the interactions of three factors: good nutrition habits, physical exercise systematically practiced and making regular medical consultations. The individual life style can be characterized by the level of motor activities he/she is involved into, by the energy consumption implied by the daily activities and the physical exercise practice, by the nutritional variations caused by the season changes, as well as by the oscillations of the inner energetic balance of the individual. The individuals' efforts to evolve went towards a global industrialization, responsible for the so called, by the experts, an „obesogenic” environment, providing people with a quick access to unhealthy nutritional supplements and fast food products, a low physical activity level and, by consequence, a low energy consumption rate, aspects favoring the obesity and the metabolic diseases (Leonard, 2010). Change in somatic indexes is obvious in a passive life style, most of individuals becoming gradually aware of their physical aspect and, equally becoming unsatisfied by

their body-built. The functional changes doubling the weight difficulties will be felt in short time and will result in human organs and systems' affections whom the individual can no longer control without the intervention of a medical professional. The specialized studies emphasize that the adipose tissue percentage generally is an indicator for the high risk metabolic diseases, heart infarction and type-2 diabetes, being studied the relations between the physical activity and the possibility to diminish the fat deposits from different areas (Davidson, Tucker, Peterson, 2010). The abdominal belt is considered an area sensitive to fat deposits being known that the adipose tissue is more accentuated here and more difficult to be diminished by physical exercises, compared to that in other areas. This is the reason for which many physical exercise programmes promise to offer energetically quick and cheap solutions, but the progress is hard, especially when the goal aims the diminishing of the umbilical fold.

Even if the physical activities represent an important support for the individual good health condition, and the population is informed by different media on the benefits of the physical exercises, more and more children, teenagers and young people live a sedentary life, estranging themselves from sports. Taking into consideration that active life style habits form during the early ages, subsequently it is unlikely for such individuals to be part of the active population. This is the reason for which practicing physical exercises is stimulated under a form intended to be attractive, relaxing and pleasant, able to cultivate the taste for exercise and to become a long term habit (Shores, West, 2010). The specialized literature makes frequent referrals to barriers preventing people to practice individual, social or environmental physical activities. Out of such barriers, we mention the absence of programme attractiveness, the precarious access to the material base, the insufficient family and social support, the deficient leisure-time management, the poor transport options, the motor activities non-supportive infrastructure and policies (Cerin, Leslie, Sugiyama et al. 2010). In this context, we consider that a major influence will have the physical education and sports classes, which will provide the individual with many exercise alternatives, which best fit the needs, abilities and expectations of the participant. The content of the physical education and sports classes must ensure both the motor base (motor skills and features), as well as the somatic, functional and psychic

premises for the physical exercise programmes to be practiced after leaving the education system. Physical education and sports remains the main discipline from the curriculum pursuing as goal the physical and psychical health of the participants, starting from pre-school, elementary and primary schools, college and higher education levels (Vasile, 2008). Starting from those facts, our survey regards the evaluation of some somatic, functional and motor dimensions of young ladies, comparing normal weight with overweight female students, in order to elaborate the most adequate physical exercises programs for them.

Methods

There were used: the bibliographic study, the observation, the experiment to find out, the test, the questionnaire and the statistics methods SPSS (Popa, 2008).

To investigate the somatic dimension, the following anthropometrical measurements were applied: height, weight, BMI, adipose tissue percentage, muscular tissue percentage.

To investigate the functional dimension, the vital capacity was measured by a spirometer, as well as the workload, by Ruffier test.

To investigate the motor dimension, the following strength trials for main muscle groups were carried out, the flexibility of the spine being measured by the flexibility ruler:

- Lift up of the trunk, from lying on the back, repeatedly, correctly executing the movement during 30 seconds;
- Lift up of the trunk from lying face down, repeatedly, correctly executing the movement during 30 seconds;
- Push-up from staying on the knees with forearms-supported, repeatedly, correctly executing the movement during 30 seconds;
- Squats, repeatedly, correctly executing the movement during 30 seconds;
- Bending forward the trunk from sitting on the floor – measurement of the distance between fingers and toes, expressed in centimeters and

transformed in grades (insufficient, enough, good, very good).

The sample consisted of 60 female students at the Faculty of Accountancy and Management Informatics within the Academy of Economic Studies of Bucharest, aged between 18 and 24 years, following the bachelor degree study cycle. Subjects were divided into two experimental groups, according to their type of body structure, namely a group of 30 normal-weight students and a group of 30 overweight students, all involved in physical exercise programmes according to the physical education and sports curriculum mandatory in the first two academic years. Students did not practice a performance sport and they rarely practice physical exercises during their leisure-time.

Trials were carried out at the beginning of the academic year 2012-2013, representing the initial test which will provide objective data required to design the physical exercise programmes.

Also, subjects answered to a questionnaire consisting of 24 items, by which collection of anamnestic data, as well as data on nutritional habits, life style and motor activities practiced by students, was aimed.

The observation method supported the subjects' investigation and the collection of data on the manifestations during the assessments and the physical education and sports classes.

The experiment to find out was used aiming to identify the differences between the somatic, functional and motor indicators of some young normal weight and overweight female students, in order to establish the most adequate physical education programs.

Results

Statistically significant differences between the normal-weight female students and the overweight female students were found only with regard to the investigated somatic parameters. For all the results obtained pursuant investigating subjects, the related statistical indexes (average, independent t-test, statistical significance threshold) were calculated as summarized presented in Table 1.

Table 1. Summary of the calculated statistical indexes

Investigated Dimension	Assessment Trial/Test	Arithmetic Mean Value for:		T test Sig, 2 tailed	Sig.
		Normal-weight	Overweight		
Somatic	Height (m)	1.63	1.64	0.63	> 0.05
	Weight (kg)	62.70	71.23	0.00	< 0.05
	Body Mass Index	23.59	26.65	0.00	< 0.05
	Adipose tissue (%)	34.88	40.16	0.00	< 0.05
	Muscular tissue (%)	27.48	25.72	0.0002	< 0.05
Functional	Vital capacity (ml)	2216.67	2416.67	0.074	> 0.05
	Ruffier index	15.47	15.03	0.476	> 0.05

Motor capacity (strength)	Lift up of the trunk from lying on the back (no/30s)	14.50	14.00	0.645	> 0.05
	Lift up of the trunk from lying face down (no/30s)	19.30	17.73	0.215	> 0.05
	Push-ups from staying on the knees forearms supported (no/30s)	12.03	12.63	0.656	> 0.05
	Squats (no/30s)	18.40	18.93	0.473	> 0.05

Hereinafter, trial data, related to which statistically significant differences were found, are analyzed. For BMI (table 2), the Levene's Test shows that data dispersion is not the similar in case of the two groups (Sig. < 0.05), and that the variance coefficient shows homogenate structures. The effect magnitude (2.70) emphasizes a very big difference between the averages

of the two groups, for 95% of the cases, this difference varying between 2.47 and 3.64. According to the independent t-test, the difference between averages reached the statistical significance threshold, Sig. = 0.000 (Sig. < 0.05). It is accepted the research hypothesis and it is rejected the null hypothesis. These results are graphically illustrated in Figure 1.

Table 2. Statistics for the BMI

Equal variances assumed	Levene's Test		t-test for Equality of Means						
	F	Sig.	T	Df	Sig. (2-tailed)	Mean Diff.	Std. Error Diff.	95% Confidence Interval of the Diff.	
								Lower	Upper
Yes	4.734	.03	10.46	58.00	.0000	3.06	.29	2.47	3.64
No			10.46	51.63	.0000	3.06	.29	2.47	3.64

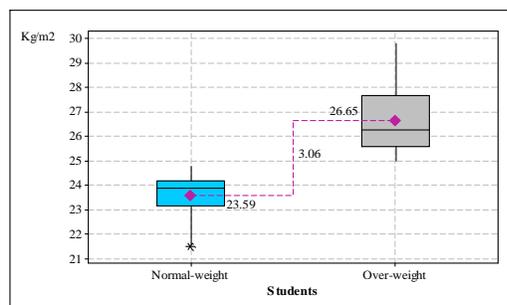


Figure 1. Graph of the BMI evaluation results

With regard to the adipose tissue percentage (Table 3), the Levene's Test shows that the data dispersion is similar in case of both groups (Sig. > 0.05) and the variance coefficient shows homogenate structures. The effect magnitude (2.02) proves a very big difference between the averages of the two groups. It is found that, in 95% of the cases, the difference varies between

Table 3. Statistics for the adipose tissue percentage

3.93 and 6.63. The independent t-test emphasizes that there are statistically significant differences of Sig. = 0.000 (Sig. < 0.05) between the averages of the two groups. It is accepted the research hypothesis and it is rejected the null hypothesis. The evaluation results on the adipose tissue percentage are graphically illustrated in Figure 2.

Equal variances assumed	Levene's Test		t-test for Equality of Means						
	F	Sig.	T	Df	Sig. (2-tailed)	Mean Diff.	Std. Error Diff.	95% Confidence Interval of the Diff.	
								Lower	Upper

Yes	.211	.65	7.82	58.00	.0000	5.28	.67	3.93	6.63
No			7.82	57.84	.0000	5.28	.67	3.93	6.63

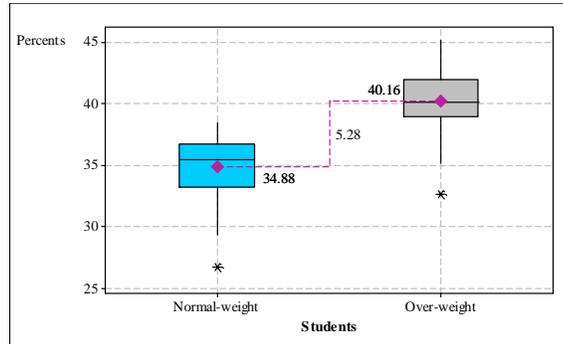


Figure 2. Graph of the adipose tissue percentage evaluation results

With regard to the muscular tissue percentage (Table 4), the Levene's Test shows that the data dispersion is similar for both groups (Sig. > 0.05). The variance coefficient shows homogenate structures. The effect magnitude (1.04) points out a very big difference between the averages of the two groups, in 95% of the cases the difference varying between -2.63 and -0.88.

The independent t-test shows that there are statistically significant differences of Sig. = 0.0002 (Sig. < 0.05) between the averages of the two groups. It is accepted the research hypothesis and it is rejected the null hypothesis. The evaluation results on the muscular tissue percentage are graphically illustrated in Figure 3.

Table 4. Statistics for the muscular tissue percentage

Equal variances assumed	Levene's Test		t-test for Equality of Means						
	F	Sig.	T	Df	Sig. (2-tailed)	Mean Diff.	Std. Error Diff.	95% Confidence Interval of the Diff.	
								Lower	Upper
Yes	.003	.96	-4.02	58.00	.0002	-1.76	.44	-2.63	-.88
No			-4.02	57.97	.0002	-1.76	.44	-2.63	-.88

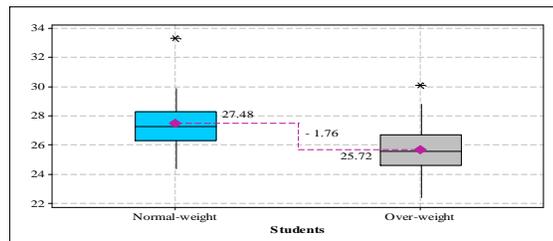


Figure 3. Graph of the muscular tissue percentage evaluation results

The Ruffier's Test results in case of normal-weight, respectively overweight female students are very similar with those obtained by using the spirometer, being recorded no statistically significant difference. Also with regard to the motor dimensions investigated by us, there are no statistically significant differences between the two groups of subjects. With regard to the

flexibility evaluation trial (figure 4), we can see that the number of overweight students having obtained the "very good" grade is bigger by 10% than the number of normal-weight students having obtained identical grade (13 overweight students vs. 5 normal-weight students). The number of normal-weight students having obtained the "good" grade is bigger by 26.7% than the number

of overweight students having obtained the identical grade (21 normal-weight students vs. 13 overweight students). The “enough” grade is obtained by 7 overweight students, higher by 10% than the number of

normal-weight students (4 students) having the same grade. The “poor” grade is present only within the group of overweight students, being obtained by 2 students, representing 6.7%.

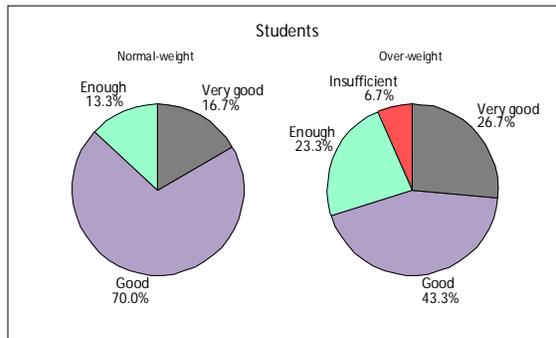


Figure 4. Graph of the flexibility evaluation results

To have an overview as much complete as possible on the two groups of subjects, statistical correlations were determined between the somatic, functional and motor dimensions. In case of normal-weight students, negative correlations between both height and weight, and higher limb strength, as measured during the push-ups from staying on the knees forearms-supported, were identified. In case of overweight students, positive correlations between the muscular tissue percentage and the back strength, as measured during the lift-ups of the trunk from lying face down, were identified.

Following the use of the questionnaire, it results that 33.3% of the subjects systematically practice physical exercise, 33.3% of the subjects practice only occasionally a certain physical activity and 33.3% of the subjects do not practice physical exercise at all. The activity preferred by the young ladies is to navigate on internet and to spend the leisure-time with their friends and families. Taking into account the common professional activity of the students from this sample, studying and reading represent implicit forms of spending the leisure-time.

Discussions

Even if there are statistically significant differences from somatic standpoint, students subject of our survey express similar features in terms of functional and motor dimensions. Statistically significant differences with regard to the weight, body mass index, adipose tissue percentage and muscular tissue percentage are found. With regard to the vital capacity, workload, main muscular group strengths and spine flexibility, the students present close values, such results arising new research hypotheses. A limit of this survey is represented by the number of subjects, taking into consideration the magnitude of the overweight and

obesity phenomenon among the young people. Also, selection of female subjects is only a warning on the alarming number of female individuals having weight difficulties. Our option is sustained by other studies, as the research belonging to Rus (2012) that demonstrates the positive effects of the physical exercises on female's biological, psychological and motor potential, investigating 66 overweight young women. With regard to the adipose tissue percentage representing a somatic index, we used an overall evaluation by applying the five fat folds formula of calculation, while a more detailed statistical analyze, based on each distinct set of data corresponding to each fat fold could reveal other interesting aspects. Bota A., Buzescu, Urzeală (2009) show that there are significant statistical differences between two normal and overweight groups of young females (23 subjects), regarding the BMI, measured through the five fat folds formula, when practicing aerobics. The investigation of the functional dimensions can be deemed insufficient because of the few tests carried out, but in the future, we consider out collaboration with a specialized laboratory, provided we can obtain the subjects' approval and the required financial resources. The overview on the motor features can be supplemented by the results of the tests intended to evaluate the other motor qualities, but the high amount of data makes us to limit only to strength and flexibility. A continuation of this survey could be carried out to identify the same parameters in case of students following another professional education programme, as well as the differences compared to other social-professional categories.

Conclusions

The significant statistical correlations between somatic indexes, like weight and muscular tissue and a



motor index, like strength, emphasizes the fact that physical exercises induce benefits on reshaping the individual's body. From this point of view, the working out programs for overweight female students will have as main goal to reduce the body weight by diminishing the fat tissue and developing the muscular mass.

It is found that insufficient participation of normal and overweight students in motor activities have an adverse effect on the general development level of the main muscular group strengths and spine flexibility, students being poorly involved in physical exercise programmes other than those executed during the physical education classes. As showed by the questionnaire, more than half of the survey subjects consist of individuals preferring to spend their leisure-time in front of a PC, with their families and friends, practicing physical exercises being only an occasional or quite absent activity. The mandatory sport and physical education class remains the organizational physical exercise form with highest effects on shaping the individual's habit to practice motor activities during the leisure-time, its content ensuring the premises for an active life style from somatic, functional and motor standpoint. This emphasizes the responsibility of the sport and physical education teacher in shaping some motor behaviors and adequate conducts, whose expression and quality directly influence the participation in physical exercise programmes and indirectly influence the wellbeing of the individual. Pursuant these steps, an objective diagnosis of the subjects' development level was carried out, enabling proper selection of contents for physical education classes, selection of most suitable educational means and establishing the workload parameters, aspects to be concretized in preparing exercise programmes intended to normal weight female students different than those intended to overweight female students.

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